Title
A block preconditioner for a four-field mixed finite element method for Biot’s equations

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Abstract
In this talk, we will discuss an efficient preconditioning method for the saddle point system resulting from a four-field mixed finite element method applied to Biot’s consolidation model. The Biot’s consolidation model is used to describe the interaction between an elastic porous media and the fluid flow within its pores. Because the four-field mixed finite element method results in a large saddle point system which is computationally expensive to solve, an efficient preconditioner will be needed to solve the refined system. The proposed preconditioner is a block diagonal preconditioner based on the Schur complement. We obtain bounds on the eigenvalues of the preconditioned matrix that are clustered away from $0$.

To further reduce the computational expense, we use an approximate preconditioner which is spectrally equivalent to the original preconditioner. Some numerical results will be discussed to show the efficiency of the preconditioner when applied to a poroelasticity problem in a layered medium.